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EXPERIMENTS WITH FERTILIZERS

EXPERIMENTS WITH FERTILIZERS

PUBLISHED BY THE
Supervising Committee of the Experiment Farm
OF THE
NORTH CAROLINA STATE HORTICULTURAL SOCIETY
SOUTHERN PINES, N. C.

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View of Fruit Department, Experiment Farm, Southern Pines, N. C.

EXPERIMENTS WITH FERTILIZERS

The practical and successful farmer is, and should be, always making experiments. The word "experiment" means a trial, and to experiment is to find out by making a trial. In farming, as in everything else, knowledge gained by repeated trial is called "experience," and experience is the farmer's best guide. Thus, the farmer who has the most experience is usually the most successful.

In the early history of farming, it was found as the result of experiment that natural and artificial manures must be put on the land in order to keep or make it fertile, and so yield good crops. What would the old farm lands of Europe and of our Eastern States be without fertilizers? Why is the farmer of to-day so far ahead of his forefathers in keeping his lands in a fertile condition? Why are constantly cultivated fields able to yield as large and even larger crops than they did fifty years ago? The answers to all these questions are to be found in the results of "Experiments with Fertilizers."

All substances which are used for the purpose of supplying plant food to the soil are called fertilizers. The farmer who fertilizes his lands simply feeds his plants or crops,

View of Irish Potato Plots, Vegetable Department, Experiment Farm, Southern Pines, N. C.

As every farmer knows, each and every crop takes a certain amount of plant food from the land, and this should be replaced. The land does not contain an unlimited supply of plant food. Unless the soil is manured or fertilized, it becomes, after successive cropping, poor and worn-out. The object of fertilizing is, therefore, to keep up the fertility of the soil, and by systematic feeding year after year to actually increase its productiveness.

Now, every farmer must experiment for himself; that is to say, he must try to find out the substances his land lacks, and his crops are most in need of. The farmer who makes experiments with different fertilizers is thus "putting the question to the soil." The answer is found in the kind and size of crops he gets.

It is now known that the three substances needed by soils to make or keep them fertile are *Nitrogen, Phosphoric Acid, and Potash*. These are the three ingredients which make up what are known as "commercial" fertilizers. It happens frequently that soils are deficient in Lime, and in such instances this ingredient must be taken into consideration. A dressing of lime about once every five or six years will keep the land well supplied with this ingredient. It may be said, then, that in experimental work the farmer has mainly to consider the three ingredients, Nitrogen, Phosphoric Acid, and Potash.

These three ingredients can be purchased on the market in the shape of raw materials, which are used in making up

Mixing Fertilizers, Experiment Farm, Southern Pines, N. C.

Applying Fertilizers, Experiment Farm, Southern Pines, N. C.

the "complete" commercial fertilizers. A few of the most common materials which are used as sources of Nitrogen are: Nitrate of Soda, Sulphate of Ammonia, Cottonseed Meal, Tankage, Fish Scrap, Dried Blood, and Castor Pomace.

As sources of Phosphoric Acid: Acid Phosphate, Dissolved Bone, Dissolved Bone Black, and Ground Bone are the most common.

The great bulk of Potash is furnished by the Stassfurt Potash Salts: Muriate of Potash, Sulphate of Potash, Sulphate of Potash-Magnesia, Kainit, and Manure Salt. Wood Ashes are also a source of Potash, but their content of this ingredient is variable.

In the following experiments, Nitrate of Soda, Acid Phosphate, and Muriate of Potash have been selected to furnish Nitrogen, Phosphoric Acid, and Potash. Sulphate of Potash is also included as a source of Potash to afford comparison with the Muriate. The Sulphate is regarded as the best for tobacco, and on certain fruits like oranges. In experiments with cotton, it is probably best to use Kainit in place of Sulphate or Muriate of Potash. Cotton planters have found Kainit a useful preventive of "rust."

In making experiments the farmer may find that decisive results are not obtained in the first year. This may be due to various causes, as unfavorable weather conditions, plant diseases, insect pests, etc. Therefore, the experimenter is advised to continue his trials with fertilizers until conclusive results are reached. Every farmer will be fully repaid for his time and trouble after he definitely learns what his soils and crops require. The knowledge gained will be worth many dollars in the buying and using of fertilizers.

SELECTING A LOCATION FOR EXPERIMENTS.

The greatest care should be taken to select a portion of the field which is as uniform in composition or quality as possible. Lack of uniformity will give wrong results and often render the experiment of little value. It is best to select level land for experimental purposes. If level land can not be had, make the experimental plots run up and down the slope, so that the washings by rain will not carry the fertilizer from one plot to another. Do not select freshly cleared lands, nor land that has been fertilized for several years past, nor land in sod, but rather " worn-out " land if possible. In the last instance, the results will show what the soil can actually produce from its natural strength. Land which has been recently fertilized is apt to be uneven in fertility, and will not fairly show the effect of the different fertilizers. Do not have any trees standing near the experimental plots.

Harvesting Potatoes, Experiment Farm, Southern Pines, N. C.

SIMPLE PLAN FOR EXPERIMENTING.

The following simple plan for experimenting can be carried out by any farmer without difficulty, and enables him to find out if the land is in need of plant food. The plan, as it is, can be adopted for vegetables, fruits and most field crops, except tobacco and legumes—that is, clovers, peas, beans, and vetches.

On tobacco Sulphate of Potash (same amount) should be substituted for Muriate, and on legumes the Nitrate of Soda should be reduced one-half (30 lbs.).

One acre of land can be divided into three plots, of one-third of an acre each, as follows: (A convenient size would be 155½ ft. x 93 1-3 ft.)

No Fertilizer.	1
200 lbs. Acid Phosphate, 40 lbs. Muriate of Potash, 60 lbs. Nitrate of Soda.	2
200 lbs. Acid Phosphate, 60 lbs. Nitrate of Soda.	3

In place of the ingredients mentioned above, ready-made fertilizers may be used, where such can be had, having the same composition as the ingredients when mixed together, as follows:

Plot No. 1. No fertilizer.

Plot No. 2. 300 pounds of a fertilizer analyzing:
3 per cent. Nitrogen,
8 per cent. Phosphoric Acid, and
6 per cent. Potash.

Plot No. 3. 260 pounds of a fertilizer containing:
9 per cent. Phosphoric Acid and
3½ per cent. Nitrogen.

From the above simple plan can be learned the following lessons:

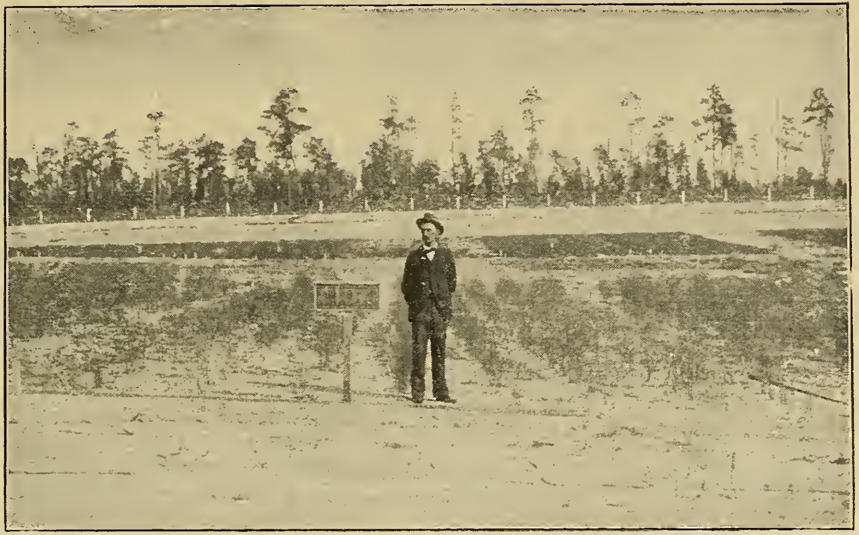
Plot No. 1 shows what the land without any fertilizer will produce.

Plot No. 2 indicates what effect an average complete fertilizer will have.

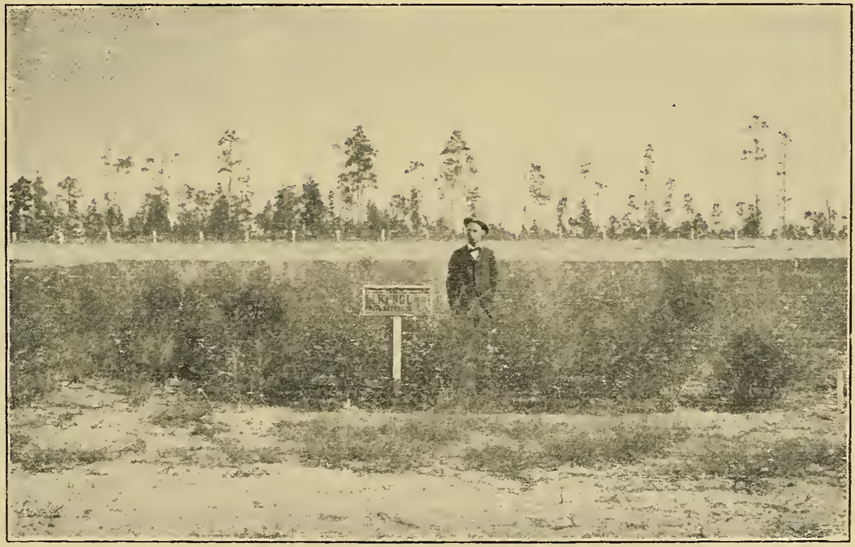
Plot No. 3 shows the effect of Nitrogen and Phosphoric Acid.

A MORE ELABORATE PLAN FOR EXPERIMENTING.

For those who wish to make a more detailed experiment, so as to study the effects of different combinations of Nitrogen, Phosphoric Acid, and Potash, more elaborate plans are



Asparagus, Unfertilized, Experiment Farm, Southern Pines, N. C.



Asparagus, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

given further on. The crops are divided into five groups, as follows:

I. Vegetables.
II. Cereals and Cotton.
III. Fruits.
IV. Special crops, like Sugar-Beets and Tobacco.
V. Legumes (Clovers, Peas, Beans, and Vetches),

and a special plan for experimenting is given for each.

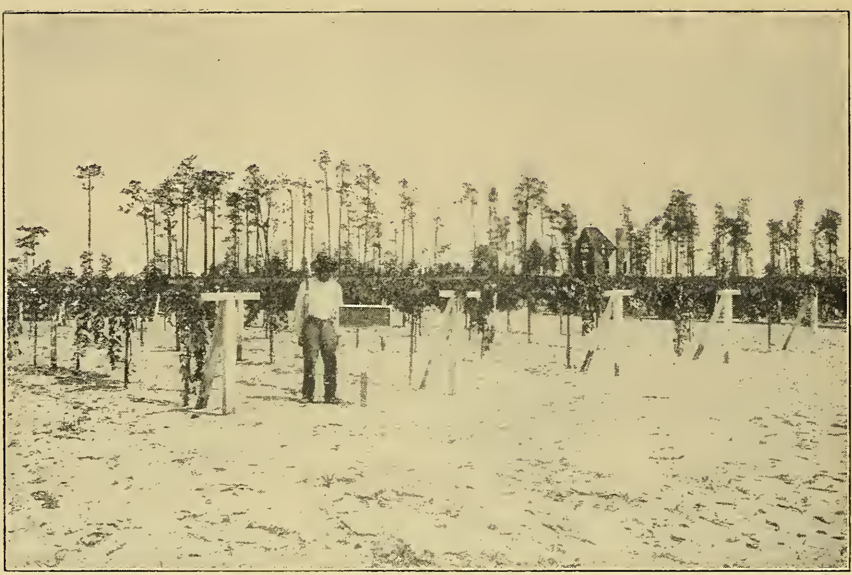
A good experiment field, embodying seven plots, of equal size (1-10 acre each), will be suitable. These plots should be separated by paths four feet in width, in order to prevent roots of the plants of one plot from feeding on the fertilizer supplied to the adjoining plot. All of the plots must be treated alike in every respect, except with regard to the amount and kind of fertilizer applied. It is best to have the plots long and narrow, because they will thus average up for unevenness of soil. Arrange the plots so that practically the same number of plants are grown on each.

The size of the plots must depend somewhat on local conditions and the kind of crop to be grown. A very convenient size is one-tenth of an acre. A strip 93 1-3 feet long by 46 2-3 feet wide would represent one-tenth of an acre in convenient shape. However, it may be best to arrange differently if the above size is not convenient. Each plot should be numbered separately. The plans are as follows:

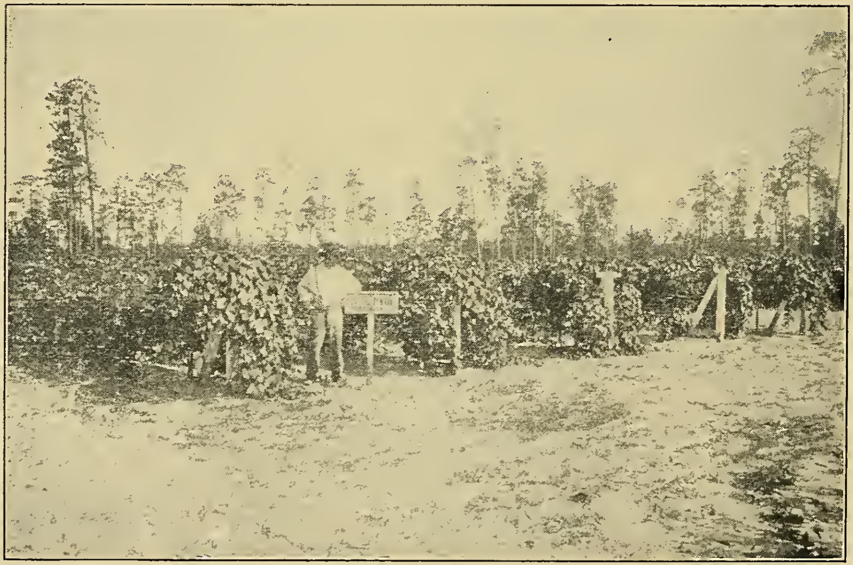
I. PLAN FOR VEGETABLES.

Seven plots, each 1-10 acre in size (93 1-3 by 46 2-3 feet).

No Fertilizer.	1
20 lbs. Muriate of Potash, 60 lbs. Acid Phosphate.	2
20 lbs. Muriate of Potash, 30 lbs. Nitrate of Soda.	3
60 lbs. Acid Phosphate, 30 lbs. Nitrate of Soda.	4
60 lbs. Acid Phosphate, 20 lbs. Muriate of Potash, 30 lbs. Nitrate of Soda.	5
60 lbs. Acid Phosphate, 20 lbs. Muriate of Potash, 30 lbs. Nitrate of Soda, 200 lbs. Lime.	6
No Fertilizer.	7



Grapes, Unfertilized, Experiment Farm, Southern Pines, N. C.



Grapes, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

II. PLAN FOR CEREALS AND COTTON.*

Seven plots, each 1-10 acre in size (93 1-3 by 46 2-3 feet).

No Fertilizer.	1
12 lbs. Muriate of Potash, 60 lbs. Acid Phosphate.	2
12 lbs. Muriate of Potash, 20 lbs. Nitrate of Soda.	3
60 lbs. Acid Phosphate, 20 lbs. Nitrate of Soda.	4
60 lbs. Acid Phosphate, 12 lbs. Muriate of Potash, 20 lbs. Nitrate of Soda.	5
60 lbs. Acid Phosphate, 12 lbs. Muriate of Potash, 20 lbs. Nitrate of Soda, 200 lbs. Lime.	6
No Fertilizer.	7

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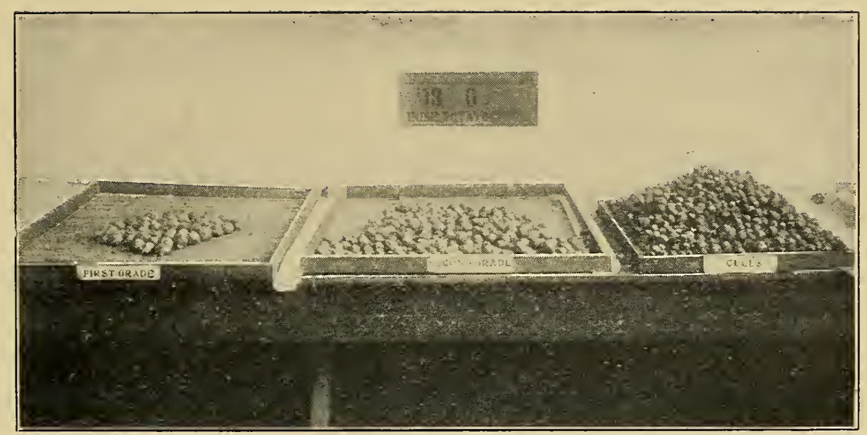
* Where the trial is to be made on Cotton, Kainit can be substituted for Muriate of Potash, as it is specially useful in preventing " Blight." Use four times as much Kainit as Muriate of Potash.

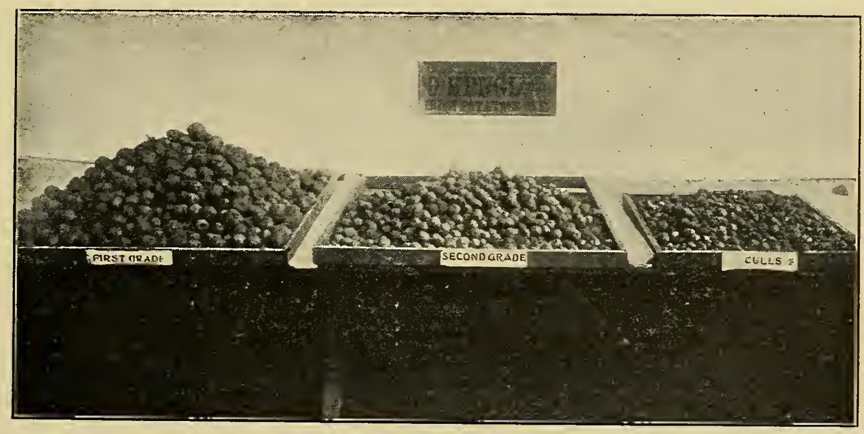
III. PLAN FOR FRUITS.

Seven plots, each 1-10 acre in size (93 1-3 by 46 2-3 feet).

No Fertilizer.	1
20 lbs. Sulphate of Potash, 60 lbs. Acid Phosphate.	2
20 lbs. Sulphate of Potash, 15 lbs. Nitrate of Soda.	3
60 lbs. Acid Phosphate, 15 lbs. Nitrate of Soda.	4
60 lbs. Acid Phosphate, 20 lbs. Sulphate of Potash, 15 lbs. Nitrate of Soda.	5
60 lbs. Acid Phosphate, 20 lbs. Sulphate of Potash, 15 lbs. Nitrate of Soda, 200 lbs. Lime.	6
No Fertilizer.	7



Irish Potatoes, Unfertilized, Experiment Farm, Southern Pines, N. C.



Irish Potatoes, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

IV. PLAN FOR SPECIAL CROPS, LIKE SUGAR-BEETS AND TOBACCO.

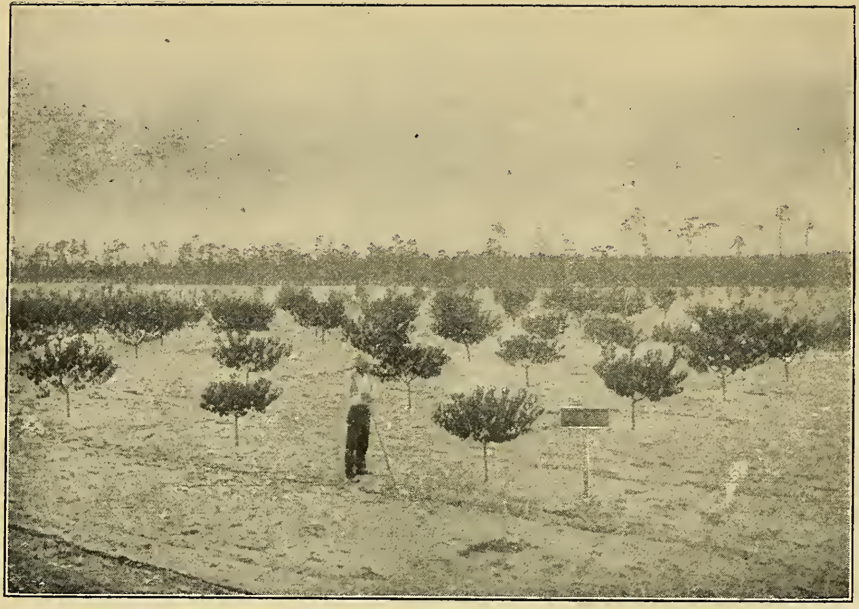
Seven plots, each 1-10 acre in size (93 1-3 by 46 2-3 feet).

No Fertilizer.	1
20 lbs. Sulphate of Potash, 60 lbs. Acid Phosphate.	2
20 lbs. Sulphate of Potash, 20 lbs. Nitrate of Soda.	3
60 lbs. Acid Phosphate, 20 lbs. Nitrate of Soda.	4
60 lbs. Acid Phosphate, 20 lbs. Sulphate of Potash, 20 lbs. Nitrate of Soda.	5
60 lbs. Acid Phosphate, 20 lbs. Sulphate of Potash, 20 lbs. Nitrate of Soda, 200 lbs. Lime.	6
No Fertilizer.	7

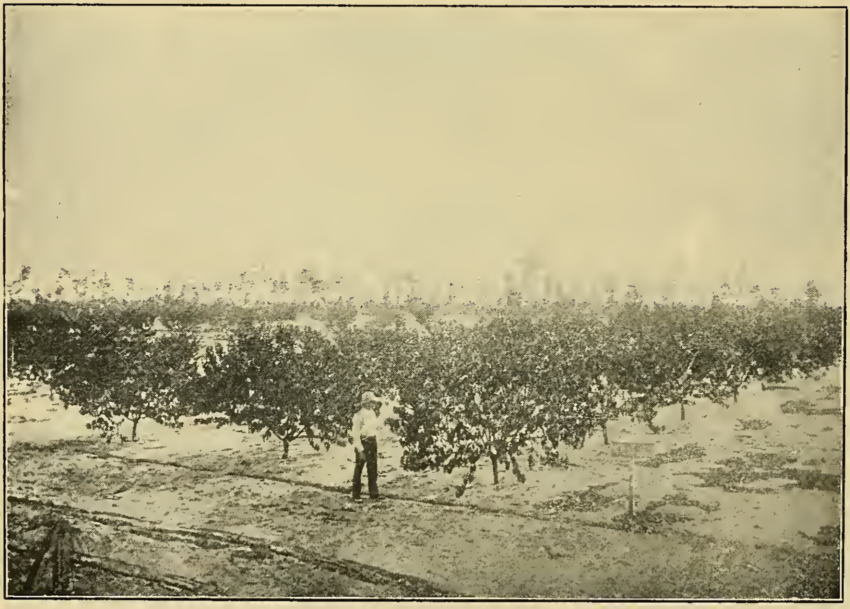
V. PLAN FOR LEGUMES (CLOVERS, PEAS, BEANS, AND VETCHES).

Seven plots, each 1-10 acre in size (93 1-3 by 46 2-3 feet).

No Fertilizer.	1
12 lbs. Muriate of Potash, 60 lbs. Acid Phosphate.	2
12 lbs. Muriate of Potash, 10 lbs. Nitrate of Soda.	3
60 lbs. Acid Phosphate, 10 lbs. Nitrate of Soda.	4
60 lbs. Acid Phosphate, 12 lbs. Muriate of Potash, 10 lbs. Nitrate of Soda.	5
60 lbs. Acid Phosphate, 12 lbs. Muriate of Potash, 10 lbs. Nitrate of Soda, 200 lbs. Lime.	6
No Fertilizer.	7



Peaches, Unfertilized, Experiment Farm, Southern Pines, N. C.



Peaches, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

THE RESULTS FROM EXPERIMENTAL PLOTS WILL SHOW:

Plot No. 1. What the land will produce without any fertilizer.

Plot No. 2. The effect of Phosphoric Acid and Potash.

Plot No. 3. The effect of Potash and Nitrogen.

Plot No. 4. The effect of Phosphoric Acid and Nitrogen.

Plot No. 5. The effect of a "complete fertilizer"; that is, one containing Potash, Phosphoric Acid, and Nitrogen.

Plot No. 6. The effect of Lime in connection with a "complete fertilizer."

Plot No. 7. Shows what the soil will produce without any fertilizer; it is also a check on *Plot No.* 1, and will indicate if the land is uniform in composition.

NOTES.

It will be noticed that one plot in each series receives an application of Lime. This will point out if the soil needs Liming. The best manner of applying the Lime would be to slake it first, and then broadcast some time during Fall or Winter, or at any rate early in the Spring, so as to allow plenty of time for the material to leach well into the soil.

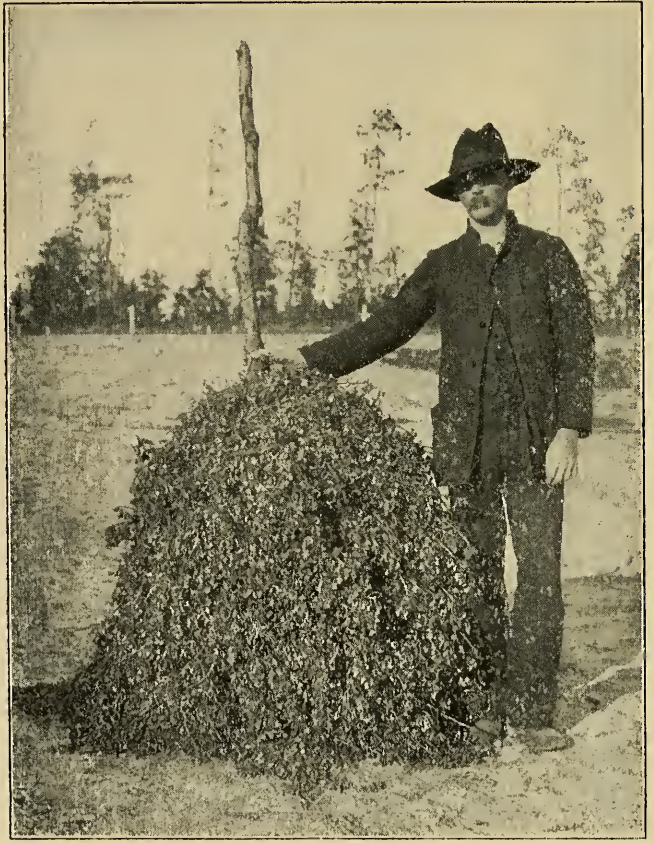
Nitrate of Soda has been selected as a source of Nitrogen, as it is probably the most satisfactory form for experimental work. The Nitrate of Soda is quick in its action, and if applied at planting time, or when there are plants growing on the plots, the results are quickly apparent.

For Phosphoric Acid, Acid Phosphate, that is, a natural Rock Phosphate, which has been treated with an acid (acidulated) to make it available, is the best form to use. Dissolved Bone Black can also be used for experimental work.

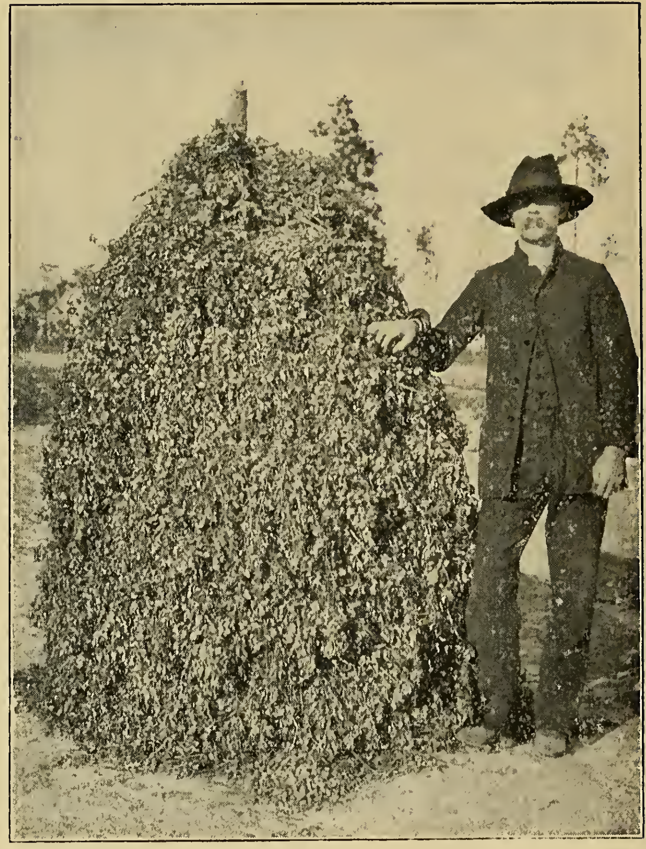
The experiment field can be measured by a chain or pole, marked with feet and inches. Each plot should be indicated by stakes or stones at the boundaries, so that the divisions will be well defined. There should be a stake at each corner of the different plots, which should be marked with the number of the plot.

The farmer should always keep in mind the effects of the three chief elements of plant food—Potash, Phosphoric Acid, and Nitrogen. Any combination of these plant foods will be shown only by comparing the results of such combinations with the results on the same soil unmanured in any shape or form; therefore, the unfertilized plots are fully as important as those fertilized.

A soil well supplied with Potash, Phosphoric Acid, and Nitrogen in available condition will not show a falling off in crops, but it is seldom that a soil contains all three of these ingredients in sufficient quantities. If any one of them is lacking, there is certain to be a decreased yield, because each ingredient is as important as the other, and there must be a sufficiency of all of them to produce a full crop. The real ob-



Peanuts, Unfertilized, Experiment Farm, Southern Pines, N. C.



Peanuts, Treated with Complete Fertilizer (Potash Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

ject of these experiments is to determine just what ingredient is lacking in the soil; a simple question, but one not so easily answered.

APPLICATION OF THE FERTILIZERS.

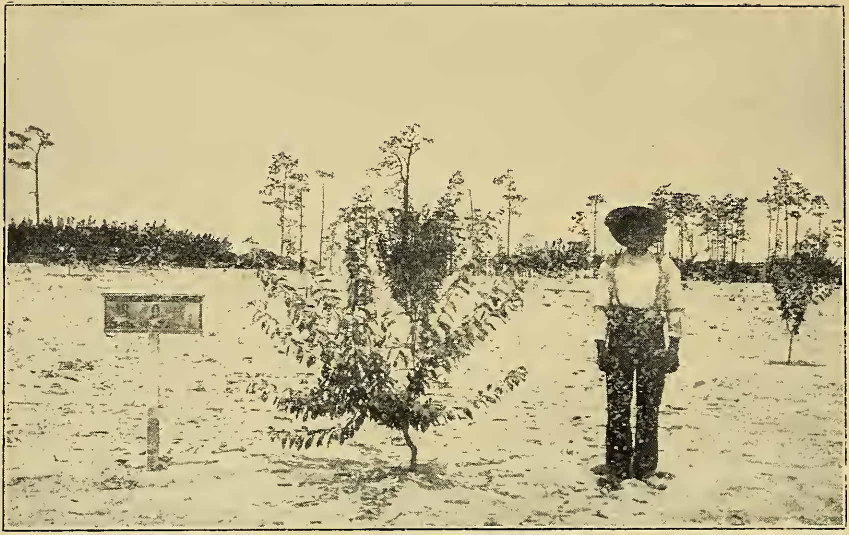
It has been found that poor results are often obtained when the fertilizers have been applied too near planting time, thereby injuring the seed or tender plants. In some cases yields have been actually diminished by such applications. To avoid this the experimenter is advised to apply the mineral fertilizers—that is, Phosphoric Acid and Potash—some time before sowing, in order that they may mix thoroughly with the soil. On some soils it would be best if the Potash and Phosphoric Acid could be applied in the Fall preceding the experiment. When this is not convenient, Phosphoric Acid and Potash should be applied early in the Spring, at least some weeks before the seed are planted.

On the other hand, Nitrogen in the form of Nitrate of Soda will give better returns if used as a top dressing at planting time. This material is very soluble, and unless taken up by the plant shortly after applying it is apt to be washed away and lost. A very satisfactory way of using Nitrate of Soda is to divide the total dose into three parts, using the first immediately after planting, and the other two at intervals of several weeks.

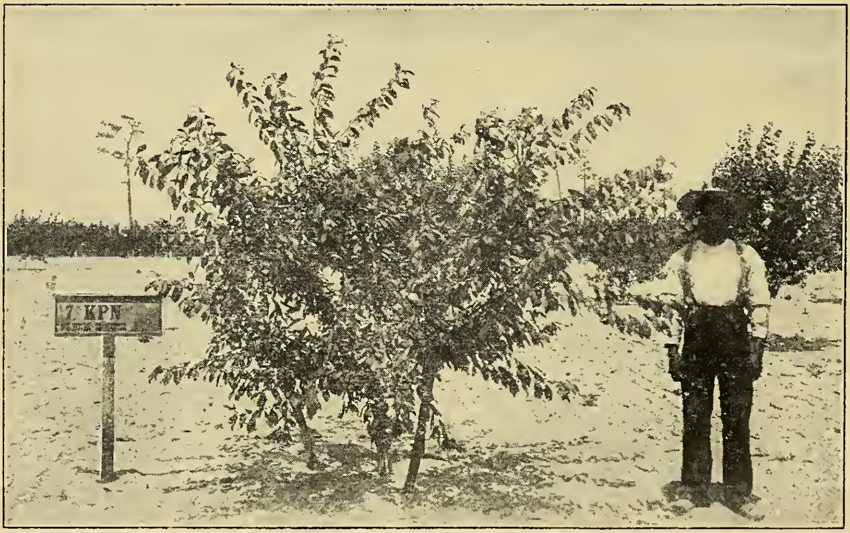
Potash and Phosphate mixed in the right proportion may be drilled in or spread broadcast evenly over the plots, and then worked into the soil by a deep running harrow, or plowed under by a shovel plow. When applied with the seed by drill, it is well to mix the fertilizer with several times its bulk of mellow earth, which should be taken, of course, from the experiment field. Once more, do not let the fertilizers come too close to the seed or young plants. Avoid windy days in spreading the fertilizers. In those cases where the farmer obtains his fertilizer ingredients unmixed, he should carefully weigh out the right quantities of each ingredient intended for each plot and mix very thoroughly before applying. This can easily be done by spreading the materials evenly on a smooth floor in layers, one above another, and then mixing them thoroughly in the same manner as a mason mixes his mortar. All this experiment work, requiring as it does care and intelligence, should only be performed by intelligent men, and not left to ignorant workmen.

PLANTING AND CULTIVATION.

Use the same kind of seed upon the whole area, and do the planting or sowing on all the plots the same day. (If a part be planted before and a part after a rain, the experiment may then be of no value.) Use every precaution necessary to secure a full stand of plants, and if a uniform stand is not secured at the first planting, plow up and plant over again. Arrange the same number of rows on each plot, and the same number of hills and plants (as nearly as possible) in each row. The cultivation and other work should be exactly



Plum Tree, Unfertilized, Experiment Farm, Southern Pines, N. C.



Plum Tree, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

alike upon each plot. The paths (four feet in width) which separate the various experiment plots should be left, of course, unplanted.

MAKING OBSERVATIONS AND REPORTS.

In making fertilizer experiments notes should be taken from the very start to the end of the season, when the crop is gathered. Every detail should be recorded in a book kept for the purpose and for future reference. The notes should be entered at the time of making observations, and not left to memory. In such record the following points should be considered:

1. Nature of soil and subsoil.
2. The date and manner of preparing the soil.
3. The date and manner of applying the fertilizer.
4. Date and manner of planting.
5. A weather record should be kept.
6. Note excessive rainfall or drought, and its effect upon the plants where the different manures are applied.
7. The character and extent of injury, such as by caterpillars, rust, and blight.
8. Crops previously cultivated, kind and quantity of manures applied, also kind of implements used in preparing, planting, and cultivating should be noted.
9. Also date of securing a stand and appearance of plants at various periods.
10. Make notes twice or three times a month of the com-

parative size and appearance of plants upon the different plots.

When the plants are far enough advanced in growth to show the effect of fertilizers, ask your neighbors to come and look at the growing plants on the plots. The object of these experiments is to instruct the farmers as to the value and uses of different kinds of plant foods.

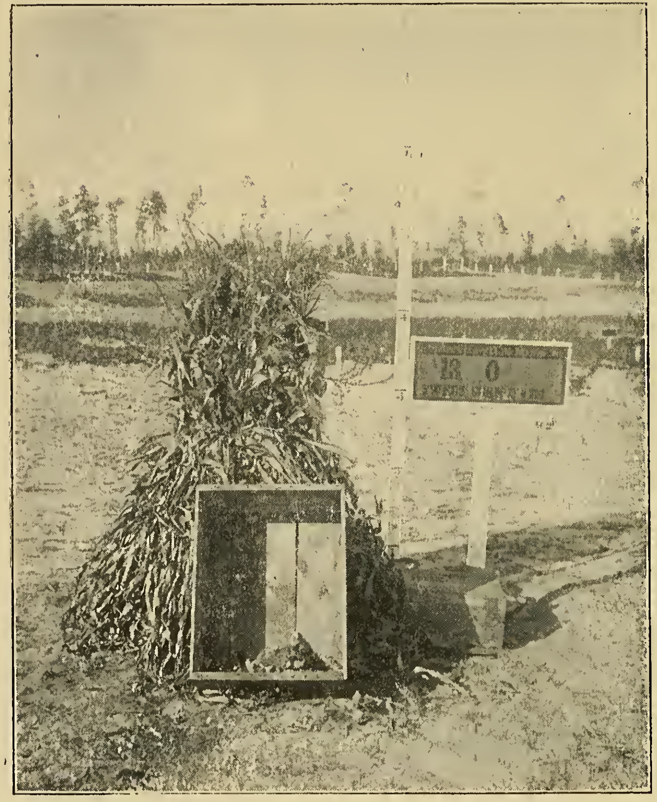
WEIGHING THE PRODUCT.

The yield from each experimental plot should be separately and carefully collected and weighed under uniform conditions. The crop should not be gathered until after the morning dew has disappeared, nor should it be gathered in rainy weather. The weight of the product from each plot is to be carefully determined as well as the quality.

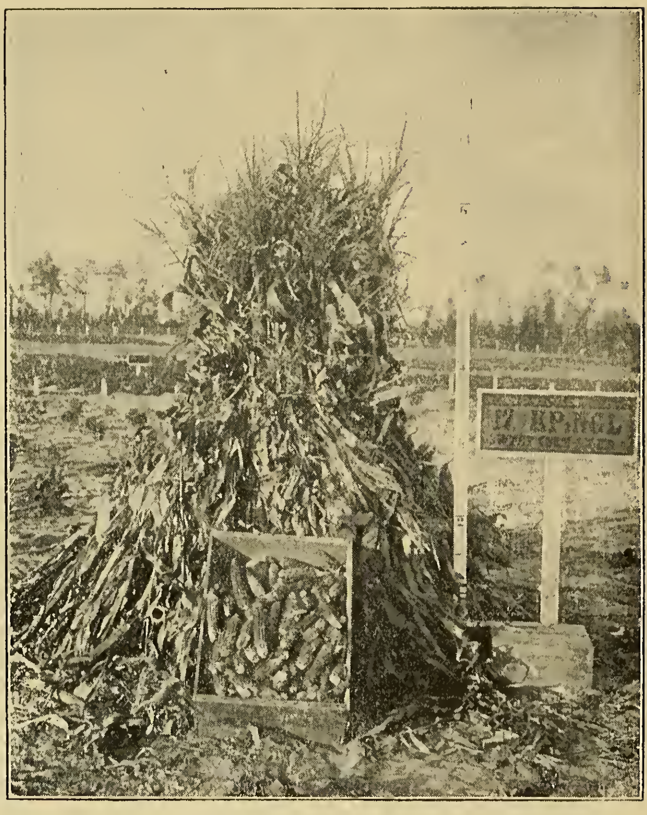
Always note the proportion of stalk or straw to grain in cereal crops, or the proportion of tops to root-crops. In other words, if there are too much straw and too little grain, or an excess of potato vines as compared with the tubers, this indicates that the fertilizer ingredients are not properly balanced.

DIRECTIONS FOR TAKING PHOTOGRAPHS OF CROPS.

It is a good thing to take, or have taken, photographs showing results of experiments with fertilizers. In this way actual scenes are brought to the eye, and can thus be kept for reference. The pictures may be taken either when the



Sweet Corn, Unfertilized, Experiment Farm, Southern Pines, N. C.



Sweet Corn, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

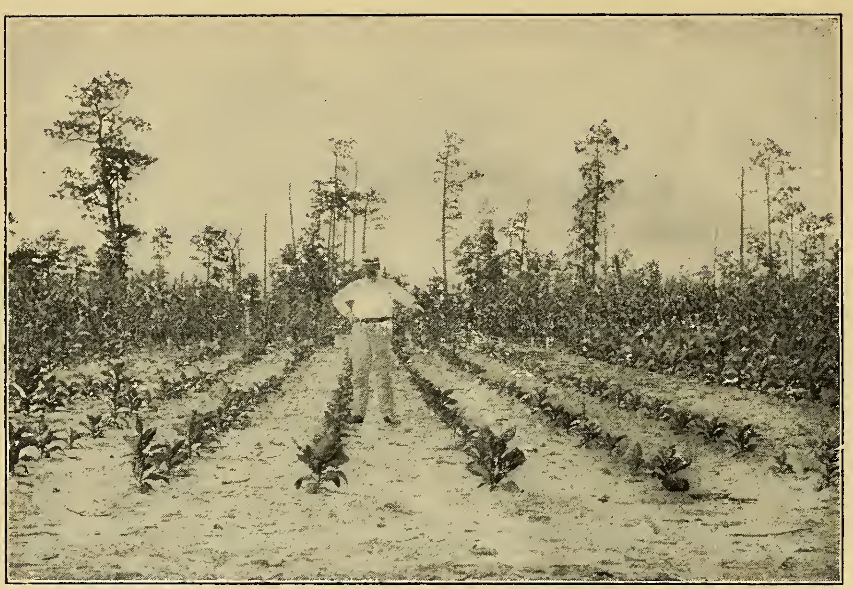
crop is still upon the field in growing condition, or the yields themselves may be photographed after harvesting, or both before and after. The experimenter should use his judgment in this matter. If the growing crop is to be photographed, the best time is when the crop shows to advantage and when differences in appearance upon the experiment plots are most pronounced.

If the yields be photographed, they should be carefully gathered from each experiment plot separately and placed in piles, in baskets, in stacks, or the like, either upon the field or at some place suitable for the purpose. Pictures of this kind should have a proper background, and an artificial background, such as a screen, may at times be arranged with advantage. Before taking photographs go over the experimental field and see how the objects look to the best advantage. Be careful to take all the photographs at the same distance and in the same position. Thus the camera should be at exactly the same distance from each experiment plot, or, if the yields are to be photographed, the camera should also be placed at exactly the same distance from the object in each view or picture. The purpose of this is to make all the yields appear in their proper relative size. In showing height and size a measuring stick with foot-marks may be placed close to the object to be photographed, and at the same distance from the camera in each case. Some interest is often given to the photographs by having one or two persons appear in the picture.

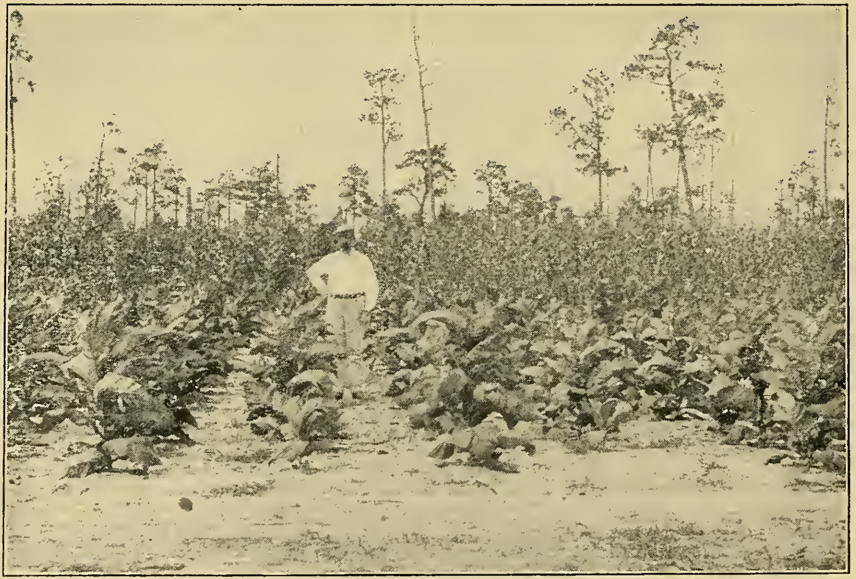
The best time to make photographs in the field is before eleven o'clock in the morning or after three in the afternoon. It should not be delayed, however, till late in the afternoon, when the sun is low. Photographs which are taken at midday or very late in the afternoon are seldom satisfactory. If the growing crops are to be photographed in the field, the best results have been obtained in most cases when the object is focused at about twenty or thirty feet from the camera. The foregoing points are given by an expert photographer who has had considerable experience in taking photographs of fertilizer experiments on the farm.

COMPOSITION OF FERTILIZER MATERIALS USED AS SOURCES OF NITROGEN.

Fertilizer Materials.	Nitrogen.	Equivalent in Ammonia.	Potash (K_2O).	Phosphoric Acid (P_2O_5).
Nitrate of Soda	15½ to 16¾	19 to 19¼	....	....
Sulphate of Ammonia	19¾ to 20¾	24 to 25¼	....	....
Dried Blood (high grade)	13 to 14¾	16 to 18	....	2 to 3
Dried Blood (low grade)	10¼ to 11	12½ to 15	....	1½ to 2
Concentrated Tankage	12¼ to 13	15 to 16	....	1 to 2
Tankage	7½ to 9	9 to 11	....	7 to 9
Bone Tankage	5 to 6	6 to 7½	....	9½ to 15
Dried Fish Scrap	9 to 10	11 to 12	....	5½ to 7
Cottonseed Meal	6½ to 7½	7½ to 9	1½ to 2	2 to 3
Castor Pomace	5 to 6	6 to 7	1 to 1½	1½ to 2
Tobacco Stems	2½ to 3	3 to 3½	2 to 10	½ to 1



Tobacco, Unfertilized, Experiment Farm, Southern Pines, N. C.



Tobacco, Treated with Complete Fertilizer (Potash, Phosphoric Acid, and Nitrogen), Experiment Farm, Southern Pines, N. C.

COMPOSITION OF MATERIALS USED AS SOURCES OF PHOSPHORIC ACID.

	TOTAL.	AVAILABLE.	INSOLUBLE.	NITROGEN.	EQUIVALENT TO AMMONIA.	POTASH K_2O.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Acid Phospate.........	16 to 19	14 to 17	1 to 2	....	....	....
Carolina Phos. Rock..	26 to 27	....	26 to 27	....	....	....
Dissolved Bone Black.	17 to 19	15 to 18	1 to 2	....	....	....
Bone Meal.............	20 to 25	5 to 8	15 to 17	2½ to 4½	3 to 5½	....
Dissolved Bone.......	15 to 17	13 to 15	2 to 3	2 to 3	2½ to 3½	....
Thomas Slag..........	22 to 24	....	22 to 24	....	....	....
Peruvian Guano......	12 to 15	7 to 8	5 to 8	6 to 10	7¼ to 12	1½ to 4

In the table above but a small part of the Phosphoric Acid in Bone Meal, and none of that in Thomas Slag, is classed as available; for, while it is true that these carriers of Phosphoric Acid show but little solubility under the methods of analysis generally applied to Phosphates, nevertheless they rank with apparently available Phosphates when finely ground. The explanation is that the animal matter in Bone Meal favors rapid decay, and that the Phosphoric Acid in Thomas Slag exists in a different form from that in material derived from bone or rock. In actual practice, the Phosphoric Acid in this slag is found to furnish food for the growing plant.

AVERAGE COMPOSITION OF STASSFURT POTASH SALTS.

NAME OF SALTS. In 100 parts are contained	Sulphate of Potash. K_2SO_4	Muriate of Potash. KCl	Sulphate of Magnesia. $MgSO_4$	Chloride of Magnesia. $MgCl_2$	Chloride of Sodium. NaCl	Sulphate of Lime. $CaSO_4$	Substances insoluble in Water.	Water.	Calculated to Pure Potash K_2O	
									Average.	Guaranteed.
A. **Crude Salts.**										
(NATURAL PRODUCTS.)										
Kainit	21.3	2.0	14.5	12.4	34.6	1.7	0.8	12.7	12.8	12.4
Carnallit	....	15.5	12.1	21.5	22.4	1.9	0.5	26.1	9.8	9.0
Sylvinit	1.5	26.3	2.4	2.6	56.7	2.8	3.2	4.5	17.4	12.4
B. **Concentrated Salts.**										
(MANUFACTURED PRODUCTS.)										
Sulphate of Potash 96%	97.2	0.3	0.7	0.4	0.2	0.3	0.2	0.7	52.7	51.8
Sulphate of Potash 90%	90.6	1.6	2.7	1.0	1.2	0.4	0.3	2.2	49.9	48.6
Sulphate of Potash-Magnesia	50.4	....	34.0	....	2.5	0.9	0.6	11.6	27.2	25.9
Muriate of Potash 90/95%	....	91.7	0.2	0.2	7.1	....	0.2	0.6	57.7	56.8
Muriate of Potash 80/85%	....	83.5	0.4	0.3	14.5	....	0.2	1.1	52.7	50.5
Muriate of Potash 70/75%	1.7	72.5	0.8	0.6	21.2	0.2	0.5	2.5	46.6	44.1
Manure Salt, min. 20% Potash	2.0	31.6	10.6	5.3	40.2	2.1	4.0	4.2	21.0	20.0
Manure Salt, min. 30% Potash	1.2	47.6	9.4	4.8	26.2	2.2	3.5	5.1	30.6	30.0

Potash in the form of Wood Ashes and Cottonseed Hull Ashes consists largely as Carbonate of Potash. Carbonate of Potash is useful as plant food, but can not safely be mixed with organic nitrogenous fertilizer materials, as this form of Potash rapidly decomposes organic matter, accompanied with more or less loss of ammonia.